

예제로 쉽게 배우는 Ansys Motion

4. Gripper

Contents

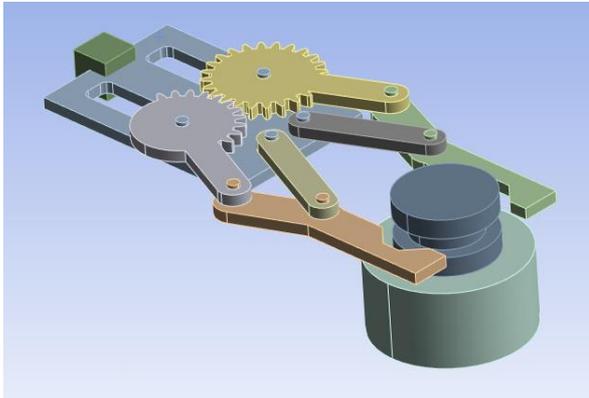
1. 개요
2. 전처리
3. 해석 & 후처리

1. 개요

1. 개요

목표

Workbench환경의 Ansys Motion으로 Dummy Body를 활용하여 Plate를 X와 Z 방향 각각 이동시켜 Object를 운반한다.

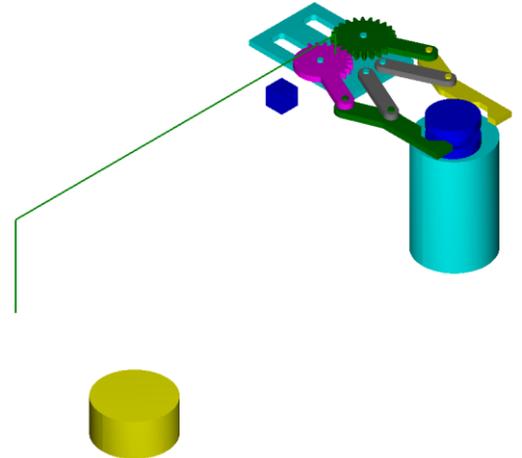


모델의 구성 요소

1. Body Type
 - Rigid Part : 11EA
2. Joint
 - Fixed Joint : 2EA
 - Revolute Joint : 8EA
 - Translational Joint : 2EA
3. Contact
 - Frictional Contact : 4EA
4. Coupler
 - Coupler : 1EA
5. Input Condition
 - Displacement : 3EA

해석 결과

Dummy Body의 활용으로 Plate가 원하는 이동 경로를 따라 이동하고, 기어는 Coupler 조인트로 구속되어 Gripper가 Object를 효과적으로 고정한다.



2. 전처리

2. 전처리

Body

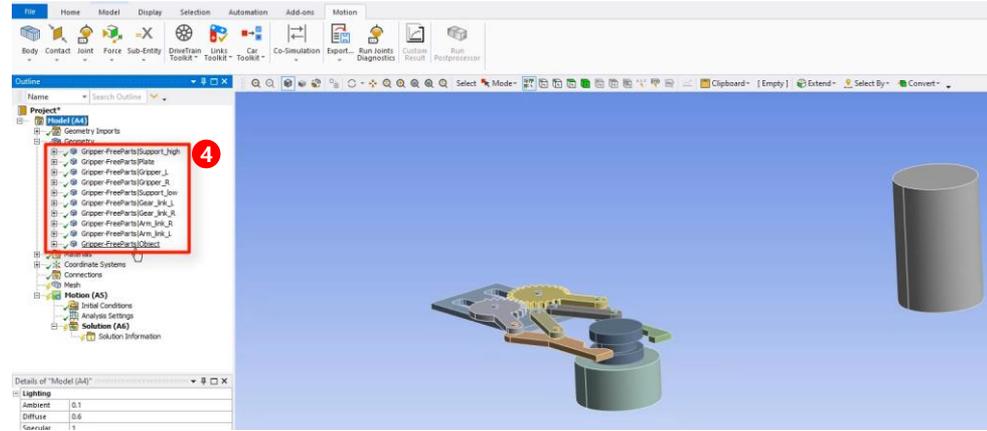
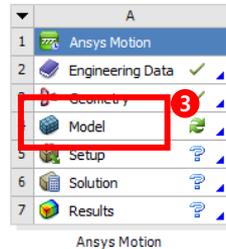
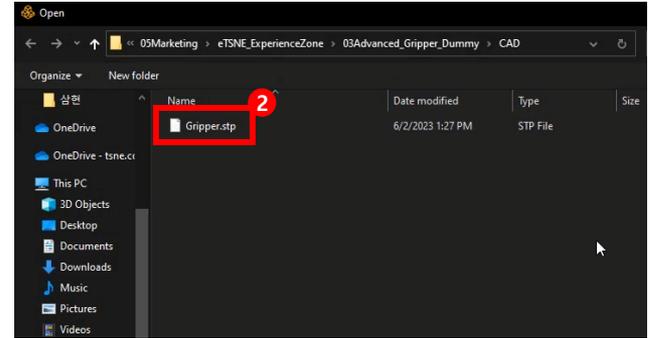
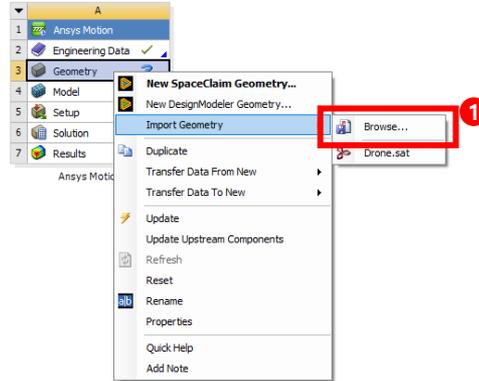
1. CAD Import 하기

- Geometry 우 클릭
- Import Geometry 클릭
- Browse 클릭

2. WS05_ValveCam.sat 선택

3. Model 더블 클릭

4. 생성된 Body 확인하기

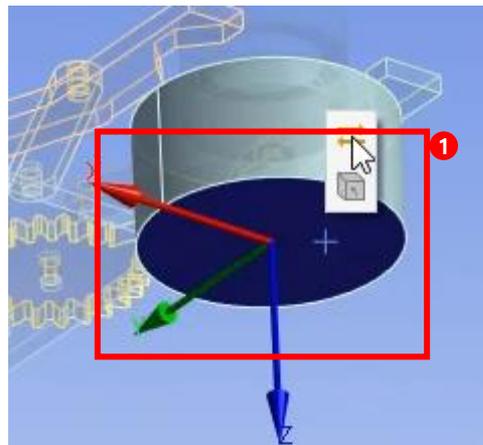


2. 전처리

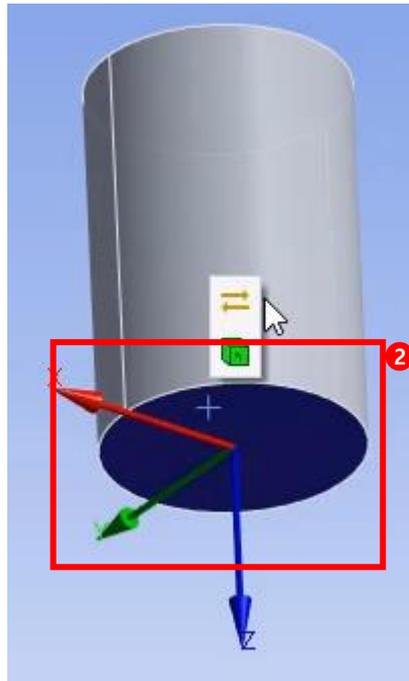
Connections

1. Fixed Joint
 - Ground to Support_low
2. Fixed Joint
 - Ground to Support_high

Fixed - Ground To Gripper-FreeParts [Su]



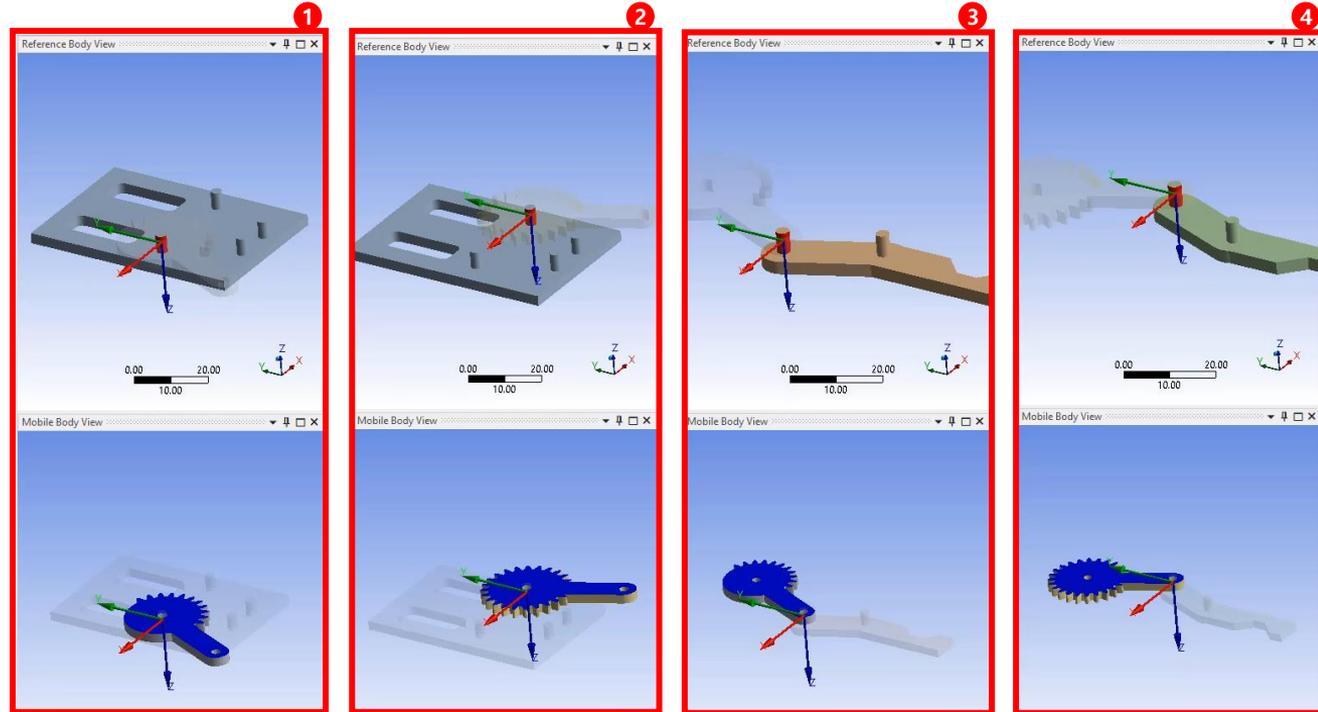
Fixed - Ground To Gripper-FreeParts [Su]



2. 전처리

Connections

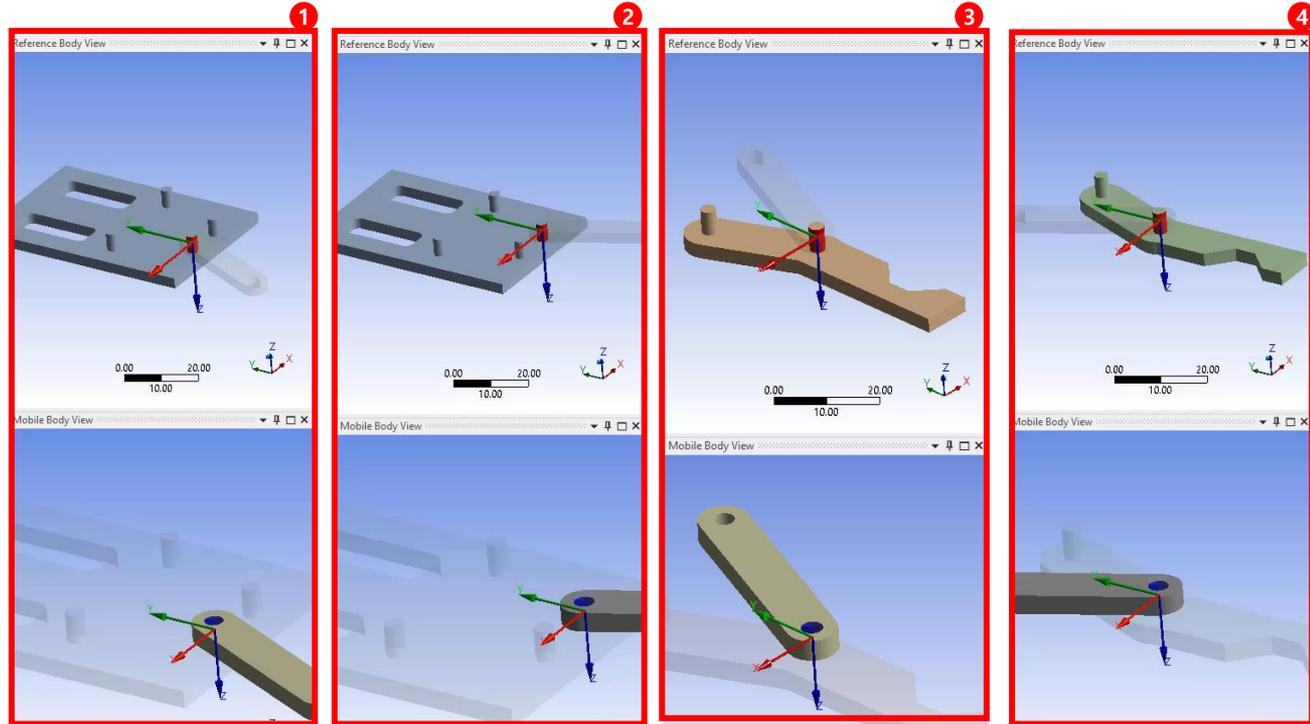
1. Revolute Joint
- Plate & Gear_link_R
2. Revolute Joint
- Plate & Gear_link_L
3. Revolute Joint
- Gripper_R & Gear_link_R
4. Revolute Joint
- Gripper_L & Gear_link_L



2. 전처리

Connections

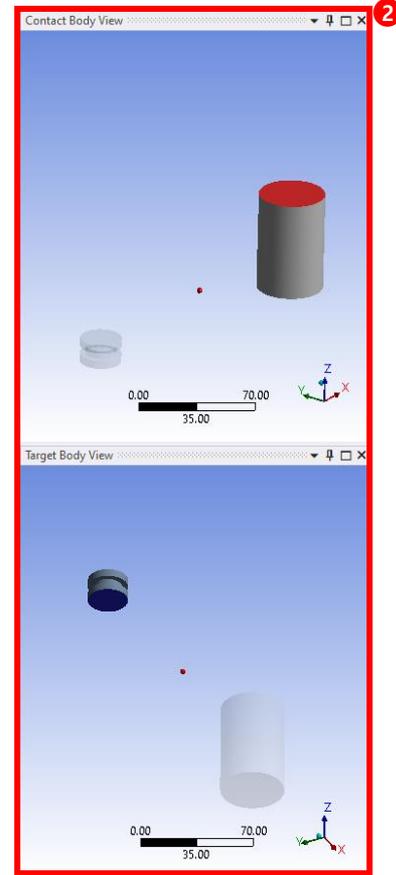
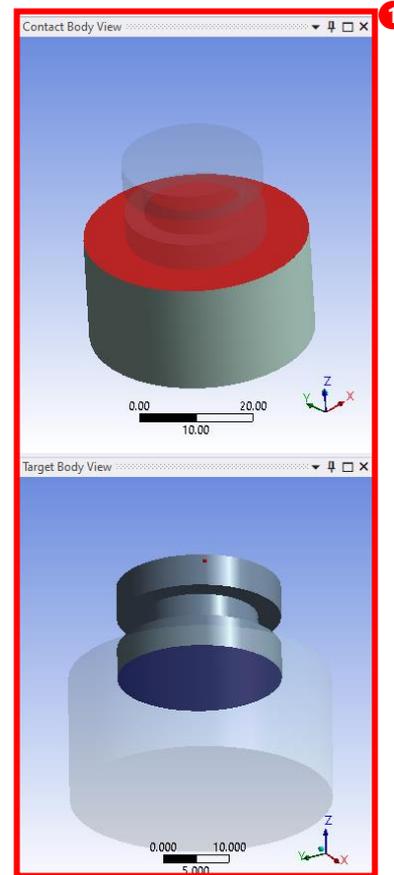
1. Revolute Joint
- Plate & Arm_link_R
2. Revolute Joint
- Plate & Arm_link_L
3. Revolute Joint
- Gripper_R & Arm_link_R
4. Revolute Joint
- Gripper_L & Arm_link_L



2. 전처리

Contact

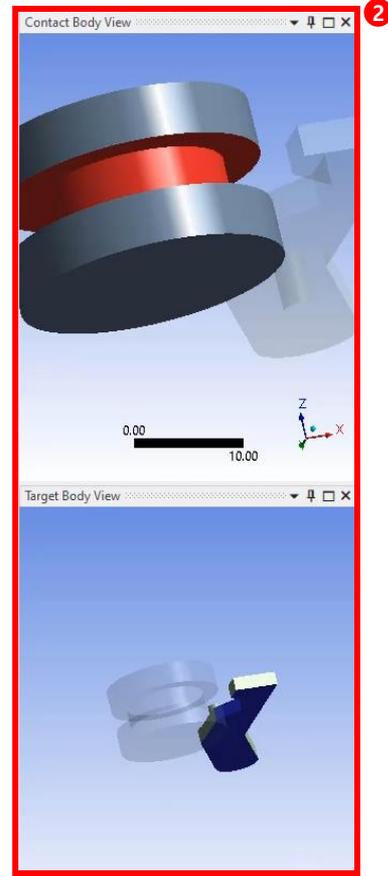
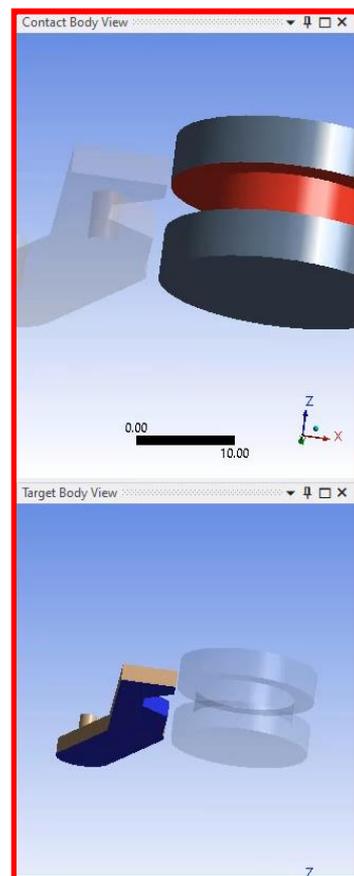
1. Frictional Contact 생성하기
- Support_low & Object
2. Frictional Contact 생성하기
- Support_high & Object



2. 전처리

Contact

1. Frictional Contact 생성하기
- Gripper_R & Object
2. Frictional Contact 생성하기
- Gripper_L & Object



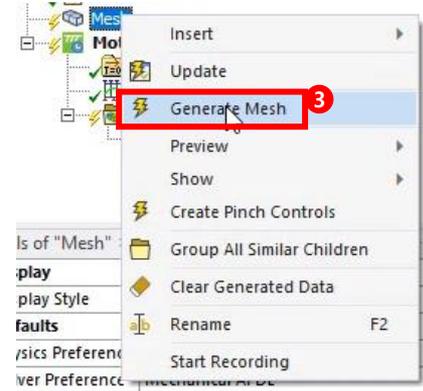
2. 전처리

Mesh

1. Mesh 생성하기
2. Element Size : 1mm
3. Generate Mesh



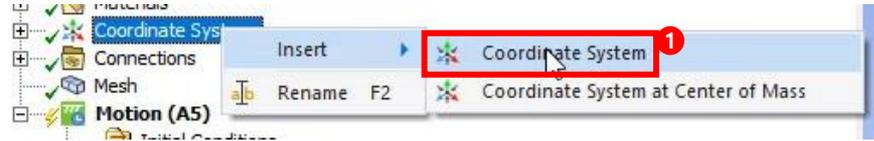
Details of "Mesh"	
[-] Display	
Display Style	Use Geometry Setting
[-] Defaults	
Physics Preference	Mechanical
Solver Preference	Mechanical APDL
Element Order	Linear
<input checked="" type="checkbox"/> Element Size	1.0 mm 2
+ Sizing	
+ Quality	
+ Inflation	
+ Advanced	
+ Statistics	



2. 전처리

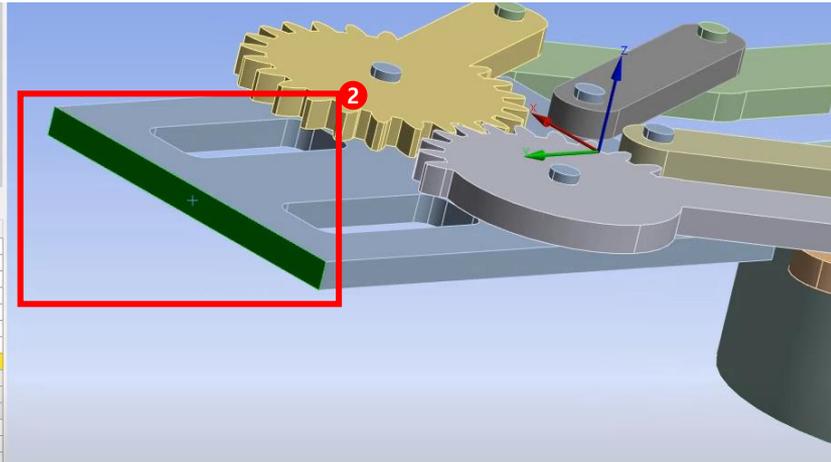
Dummy Body

1. Coordinate System 생성
2. 위치 지정
- Plate의 면 선택



Details of "Coordinate System"

Definition	
Type	Cartesian
Coordinate System	Program Controlled
APDL Name	
Suppressed	No
Origin	
Define By	Geometry Selection
Geometry	Click to Change
Origin X	0. mm
Origin Y	0. mm
Origin Z	0. mm
Principal Axis	
Axis	X
Define By	Global X Axis



2. 전처리

Dummy Body

1. Model 우클릭
2. Solid 생성
3. Coordinate System 선택

The screenshot illustrates the steps to create a dummy body in a CAD application. The 'Insert' menu is open, and the 'Construction Geometry' > 'Solid' path is highlighted. The 'Details of Solid' panel shows the definition of the solid as a 'Coordinate System'.

Details of "Solid"	
Definition	
Type	Box
Coordinate System	Coordinate System
X1	0. mm
X2	0. mm
Y1	0. mm
Y2	0. mm
Z1	0. mm
Z2	0. mm
Part Name	

2. 전처리

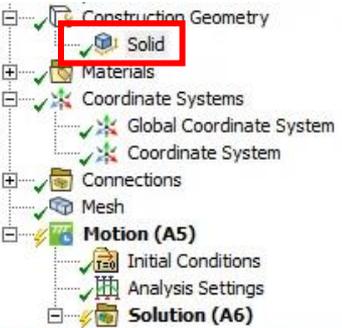
Dummy Body

1. 각 변의 길이 정의

- X1 : 5mm
- X2 : -5mm
- Y1 : 5mm
- Y2 : -5mm
- Z1 : 5mm
- Z2 : -5mm

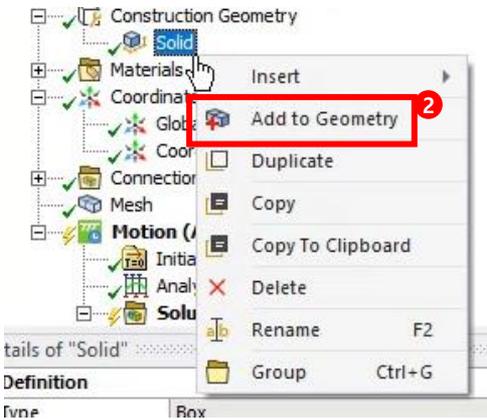
2. Add to Geometry

3. 생성된 Solid Body 확인



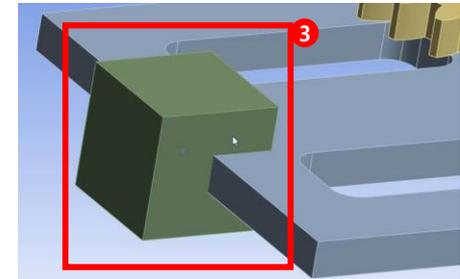
Details of "Solid"

Definition	
Type	Box
Coordinate System	Coordinate System
X1	5. mm
X2	-5. mm
Y1	5. mm
Y2	-5. mm
Z1	5. mm
Z2	-5. mm
Part Name	



tails of "Solid" : Box

Definition



2. 전처리

Dummy Body

1. Solid Body 물성 정의
- Structural Steel

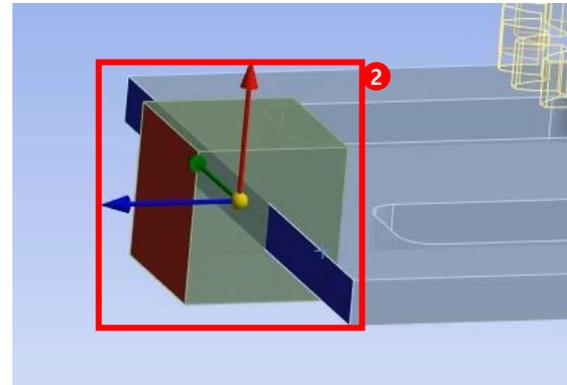
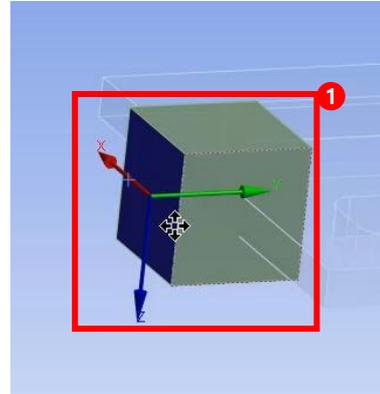
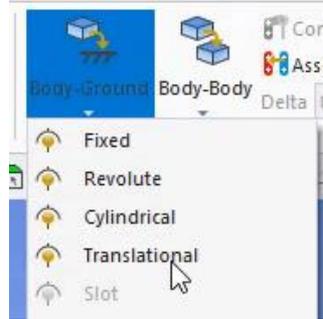
The screenshot displays a CAD software interface. The top portion shows a tree view of the model's structure. The 'Solid' object is highlighted with a red box. Below the tree view, the 'Details of "Solid"' panel is open, showing various properties. The 'Material' section is expanded, and the 'Assignment' property is set to 'Structural Steel', which is also highlighted with a red box and a red circle containing the number '1'.

Details of "Solid"	
Graphics Properties	
Definition	
<input type="checkbox"/> Suppressed	No
Stiffness Behavior	Rigid
Reference Temperature	By Environment
Treatment	None
Material	
<input type="checkbox"/> Assignment	Structural Steel 1
Bounding Box	
Properties	
Statistics	

2. 전처리

Translational Joint

1. Translation Joint 생성 (글로벌 X 방향)
 - Reference : Ground
 - Mobile : Solid
2. Translation Joint 생성 (글로벌 Z 방향)
 - Reference : Solid
 - Mobile : Plate



2. 전처리

Function Expression

1. Function Expression 생성하기 (3 EA)

- Trans_X
- Trans_Z
- Rotation

2. Trans_X의 수식 입력

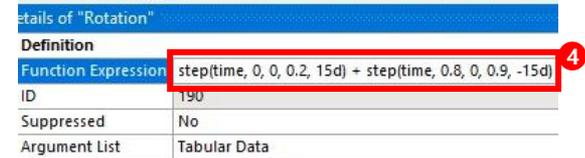
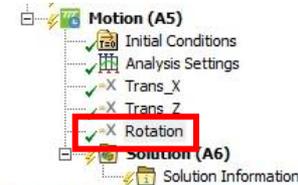
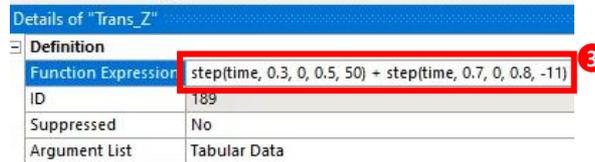
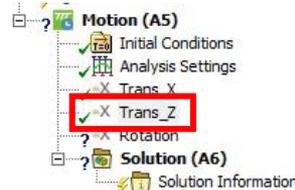
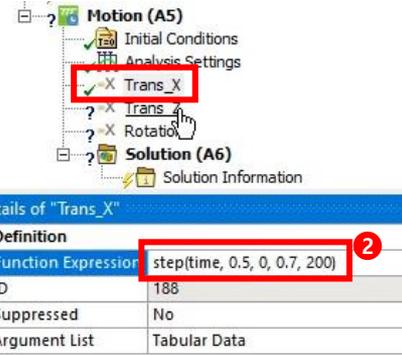
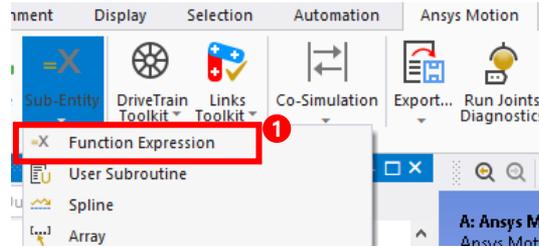
: `step(time, 0.5, 0, 0.7, 200)`

3. Trans_Z의 수식 입력

: `step(time, 0.3, 0, 0.5, 50)`
 + `step(time, 0.7, 0, 0.8, -11)`

4. Rotation의 수식 입력

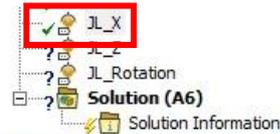
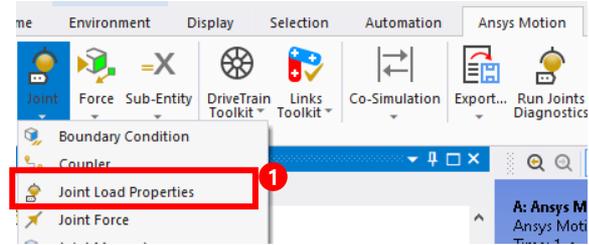
: `Step(time, 0, 0, 0.2, 15d)`
 + `step(time, 0.8, 0, 0.9, -15d)`



2. 전처리

Joint Load Properties

1. Joint Load Properties 생성하기 (3 EA)
 - JL_X
 - JL_Z
 - JL_Rotation
2. JL_X의 조건 정의
 - Translational Ground to Solid
 - Motion Function
 - Displacement
 - Function Expression
 - Trans_X



Details of "JL_X"	
Scope	Translational - Ground To Solid [Translational]
Definition	Motion Function
Translational Motion	Displacement
Translational Motion Type	Function Expression
Magnitude	Trans_X
Function Expression	step(time, 0.5, 0, 0.7, 200) [mm]
Expression	
Use Positive Displacement Restriction	None
Use Negative Displacement Restriction	None
Suppressed	No

2. 전처리

Joint Load Properties

3. JL_Z의 조건 정의

- Translational Solid to Plate
- Motion Function
- Displacement
- Function Expression
- Trans_Z

4. JL_Rotation의 조건 정의

- Revolute Plate to Gear_link_L
- Motion Function
- Rotation
- Function Expression
- Rotation

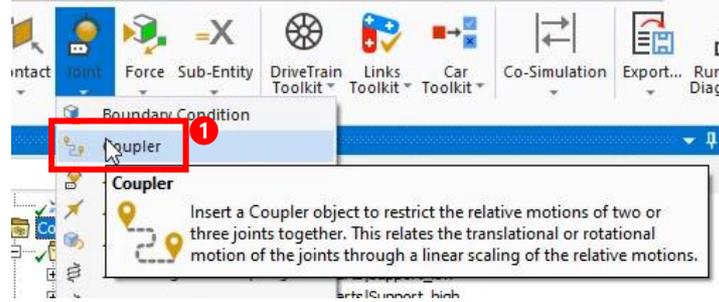
Details of "JL_Z"	
Scope	Translational - Solid To Gripper-FreeParts Plate [Translational]
Joint	
Definition	
Translational Motion	Motion Function
Translational Motion Type	Displacement
Magnitude	Function Expression
Function Expression	Trans_Z
Expression	step(time, 0.3, 0, 0.5, 50) + step(time, 0.7, 0, 0.8, -11) [mm]

Details of "JL_Rotation"	
Scope	Revolute - Gripper-FreeParts Plate To Gripper-FreeParts Gear_link_L [..]
Joint	
Definition	
Rotational Motion	Motion Function
Rotational Motion Type	Rotation
Magnitude	Function Expression
Function Expression	Rotation
Expression	step(time, 0, 0, 0.2, 15d) + step(time, 0.8, 0, 0.9, -15d) [rad]

2. 전처리

Coupler

1. Coupler 생성
2. 대상 Joint 선택
 - Driver : Plate to Gear_link_R
 - First Coupled : Plate to Gear_link_L



Details of "Coupler"	
Definition	
Coupler Type	Two Joints Coupler
ID	202
Suppressed	No
Driver	
Joint	Revolute - Gripper-FreeParts Plate To Gripper-FreeParts Gear_link_R [Revolute]
Type	Rotational
<input type="checkbox"/> Ratio	1
First Coupled	
Joint	Revolute - Gripper-FreeParts Plate To Gripper-FreeParts Gear_link_L [Revolute]
Type	Rotational
<input type="checkbox"/> Ratio	1

3. 해석 & 후처리

3. 해석 & 후처리

Solve

1. Solution의 Total Deformation 생성
2. Solve 실행

